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Test Report: 87772-2TRFWL

Applicant: VTech Telecommunications Canada Ltd.
200-7671 Alderbridge Way
Richmond, BC
V6X 1Z9

Apparatus: LS5145 Phone - Handset

FCC ID: EW780-6101-00

In Accordance With: FCC Part 15 Subpart B, 15.107 and 15.109
Unintentional Radiators
and
FCC Part 15 Subpart C, 15.247
FHSS System and Digitally Modulated Radiators
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz
Class II Permissive Change

Tested By: Nemko Canada Inc.
303 River Road
Ottawa, Ontario
K1V 1H2

Authorized By: 
Xu Jin, Wireless Specialist

Date: August 2, 2007

Total Number of Pages: 24

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	LS5145 Phone - Handset
Specification:	FCC Part 15 Subpart B, 15.107 and 15.109 FCC Part 15 Subpart C, 15.247, Class II Permissive Change
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Heng Lin EMC / Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TABLE OF CONTENTS

Report Summary 2
Section 1 : Equipment Under Test..... 4
1.1 Product Identification4
1.2 Samples Submitted for Assessment.....4
1.3 Theory of Operation4
1.4 Technical Specifications of the EUT5
1.5 Block Diagram of the EUT.....5
Section 2 : Test Conditions..... 6
2.1 Specifications6
2.2 Deviations From Laboratory Test Procedures6
2.3 Test Environment6
2.4 Test Equipment.....6
Section 3 : Observations 7
3.1 Modifications Performed During Assessment7
3.2 Record Of Technical Judgements7
3.3 EUT Parameters Affecting Compliance7
3.4 Test Deleted.....7
3.5 Changes to EUT for Class II Permissive Change7
Section 4 : Results Summary 8
4.1 FCC Part 15 Subpart B : Test Results9
4.2 FCC Part 15 Subpart C : Test Results9
Appendix A : Part 15 Subpart B - Test Results 10
Clause 15.109(a) Radiated Emissions.....10
Appendix B : Part 15 Subpart C - Test Results 11
Clause 15.207(a) Powerline Conducted Emissions11
Clause 15.209(a) Radiated Emissions within Restricted Bands13
Clause 15.247(b)(1) Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band15
Clause 15.247(d) Radiated Emissions Not in Restricted Bands19
Appendix C : Setup Photographs 23
Appendix D : Block Diagram of Test Setups 24

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

LS5145 Phone - Handset

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
4	LS5145 Phone - Handset	None
5	LS5145 Phone - Handset	None
3	Charger	None
8	Component Telephone (MN # UD-0602)	None

The first samples were received on: May 29, 2007

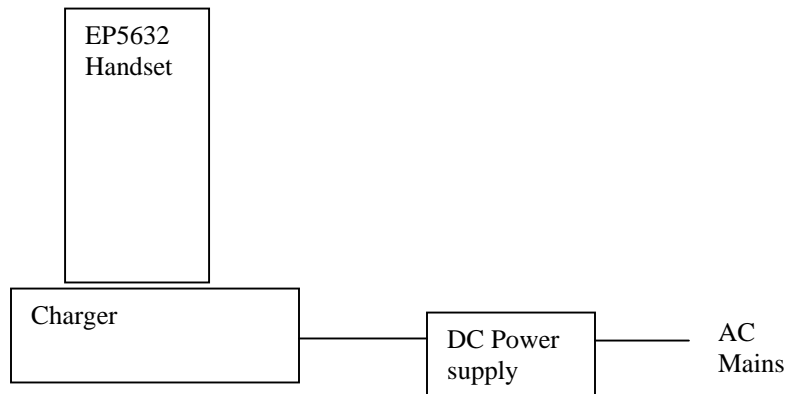
1.3 Theory of Operation

The apparatus is the handset for a 5.8GHz frequency hopping telephone.

1.4 Technical Specifications of the EUT

Operating Frequency:	5744.736-5825.952MHz
Peak Output Power:	25.48 dBm (Conducted Output Power)
Emission Designator	850K6F1E
Modulation:	GFSK
Antenna Data:	1 dBi
Antenna Connector:	Integral

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart B, 15.107 and 15.109

Unintentional Radiators

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators

902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Jan. 16/08
Receiver	Rohde & Schwarz	ESVS-30	FA001445	July 14/07
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU	FA002043	Oct. 24/07
LISN	Rohde & Schwarz	ENV216	FA002023	Aug. 28/07
Biconical (2) Antenna	EMCO	3109	FA000904	Sept. 12/07
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Sept. 12/07
Horn Antenna #2	EMCO	3115	FA000825	Jan. 30/08
Horn 18 – 26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU
Horn 26.5 – 40 GHz	Electro-Metrics	SH-50/60-2	FA000485	COU
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	Aug. 02/07
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	Aug. 02/07
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	Aug. 02/07
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU

COU – Calibrate on Use

NCR – No Calibration Required

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Changes to EUT for Class II Permissive Change

The following changes have been performed to the EUT as declared by the manufacturer:

Item	B&O2 Handset (New model: LS5145)	Blue Handset (Approved model: EP5632)
5.8 GHz Tx Antenna	Slightly changing from Blue: coil pitch, and beding angle	L profile coil antenna
5.8 GHz Rx Antenna	Slightly changing from Blue: coil pitch, and bending angle	L profile coil antenna
RF Layout	Compenents (transverter, PA, etc.) Placement under the shield changed from Blue Project	Direct PCB to PCB soldering
RF Module to Baseband Interface	Ribbon Cable	Direct PCB to PCB soldering

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No : not applicable / not relevant.
- Y Yes : Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart B : Test Results

Part 15	Test Description	Required	Result
15.107(a) 15.109(a)	Conducted Emissions for Class B Radiated Emissions for Class B	Y (1) Y	PASS PASS

4.2 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of power supply	Y	PASS
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(a)(1)	Frequency hopping systems	N(2)	
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	N	
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N(2)	
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	N	
15.247(a)(2)	Systems using digital modulation techniques	N	
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	Y	PASS
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	N	
15.247(b)(4)	Maximum peak output power	Y	PASS
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	N	
15.247(f)	Time of Occupancy for Hybrid Systems	N	

Notes:

- (1) See test results for clause 15.207(a).
- (2) This requirement was not tested due to the changes to the circuitry would have no affect on the results obtained in the original assessment. (Refer to the original report 6W75071)

Appendix A : Part 15 Subpart B - Test Results

Clause 15.109(a) Radiated Emissions

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvoltsmeter)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Test Conditions:

Sample Number:	2, 7	Temperature (°C):	22
Date:	June 18, 2007	Humidity (%):	45
Modification State:	0	Tester:	Heng Lin
		Laboratory:	Ottawa

Test Results:

See Attached Table for Results

Additional Observations:

The Spectrum was searched from 30MHz to the 5th Harmonic.

The measurement was performed at 3m OATS.

Measurement equipment setup was 120kHz Quasi-peak detector for measurements below 1 GHz and 1 MHz RBW / VBW peak detector above 1 GHz.

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
318.2397	LP1	V	15.3	14.7	N/A	1.9	31.8	46.0	14.2	Q-Peak
318.2397	LP1	H	12.5	15.4	N/A	1.9	29.8	46.0	16.3	Q-Peak
345.5896	LP1	V	17.7	14.8	N/A	1.8	34.3	46.0	11.7	Q-Peak
345.5896	LP1	H	15.3	15.3	N/A	1.8	32.4	46.0	13.6	Q-Peak

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Appendix B : Part 15 Subpart C - Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dB μ V)		
Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

Test Conditions:

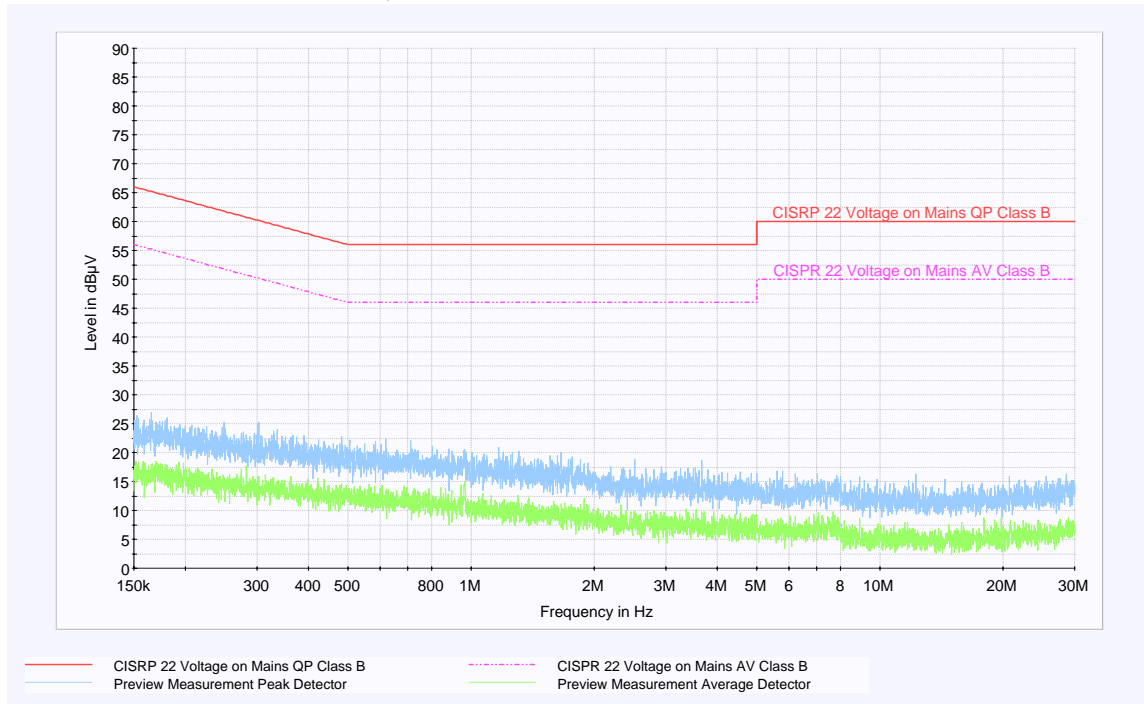
Sample Number:	3, 5, 8	Temperature (°C):	22
Date:	June 11, 2007	Humidity (%):	45
Modification State:	0	Tester:	Heng Lin
		Laboratory:	Ottawa

Test Results: See Attached Plots.

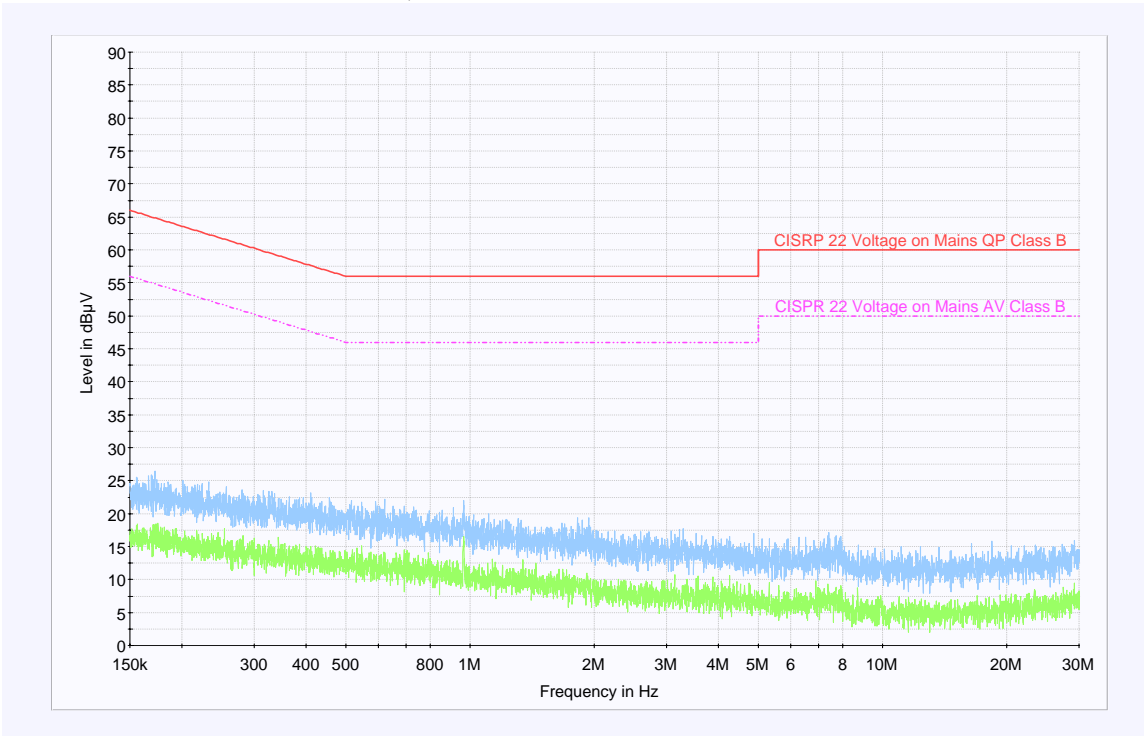
Additional Observations:

All measurements for conducted emissions were performed using a Peak detector, Average detector and Quasi-Peak detector with 9 kHz RBW.

AC Mains Phase Line – 120VAC, 60Hz



AC Mains Neutral Line – 120VAC, 60Hz



Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvoltmeter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Conditions:

Sample Number:	5	Temperature (°C):	22
Date:	June 14, 2007	Humidity (%):	45
Modification State:	0	Tester:	Heng Lin
		Laboratory:	Ottawa

Test Results:

See attached table.

Additional Observations:

The Spectrum was searched from 30 MHz to 40 GHz Harmonic.

These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

All measurements for radiated emissions within the restricted bands were performed using a Peak detector with 100kHz RBW / VBW below 1GHz and a Peak Detector with 1MHz RBW / VBW above 1GHz.

Radiated Emission below 8 GHz were measured at 3 meter OATS.

Radiated Emissions above 8 GHz were measured at 1 meter and corrected with $20\log(3/1) = 9.5$ dB.

Frequency (MHz)	Ant	Pol. V/H	RCVD Signal (dBµV/m)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Distance Correction	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	
1	11489.472	Horn2	V	35.0	38.6	NA	21.3	9.5	64.1	74.0	9.9	Peak
									42.8	54.0	11.2	Average
2	11489.472	Horn2	H	30.9	38.6	NA	21.3	9.5	60.0	74.0	14.0	Peak
									38.7	54.0	15.3	Average
3	11570.688	Horn2	V	35.9	39.2	NA	21.3	9.5	65.6	74.0	8.4	Peak
									44.3	54.0	9.7	Average
4	11570.688	Horn2	H	31.0	39.1	NA	21.3	9.5	60.6	74.0	13.4	Peak
									39.3	54.0	14.7	Average
5	11651.904	Horn2	V	34.2	39.2	NA	21.3	9.5	63.9	74.0	10.1	Peak
									42.6	54.0	11.4	Average
6	11651.904	Horn2	H	31.6	39.1	NA	21.3	9.5	61.2	74.0	12.8	Peak
									39.9	54.0	14.1	Average

Clause 15.247(b)(1) Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Test Conditions:

Sample Number:	3, 4	Temperature (°C):	20
Date:	June 11, 2007	Humidity (%):	43
Modification State:	0	Tester:	Heng Lin
		Laboratory:	Ottawa

Test Results:

See the attached plots and table.

Conducted Output Power:

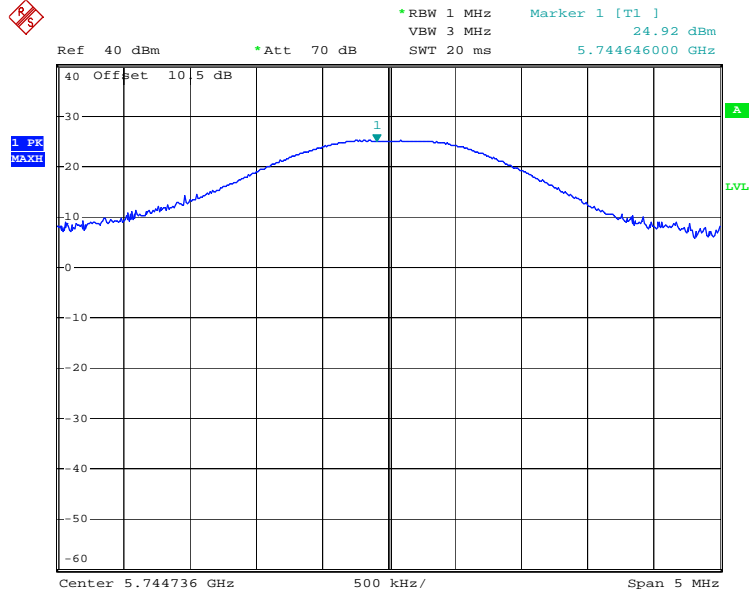
Measured output power = 25.48 dBm
 Maximum output power = 25.48 dBm + 1 dBi = 26.48 dBm EIRP
 Limit = 36 dBm EIRP

The test was performed with an new fresh battery.

Note: The EUT was modified by the manufacturer to perform conducted measurements.

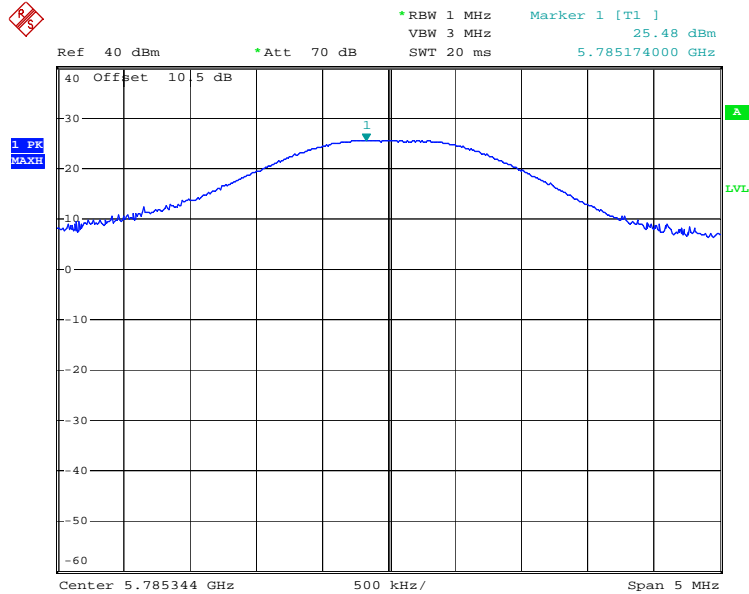
Channel Range	Measured Output Power	
Low	24.92 dBm	0.310 W
Mid	25.48 dBm	0.353 W
High	25.31 dBm	0.340 W

Low Channel:



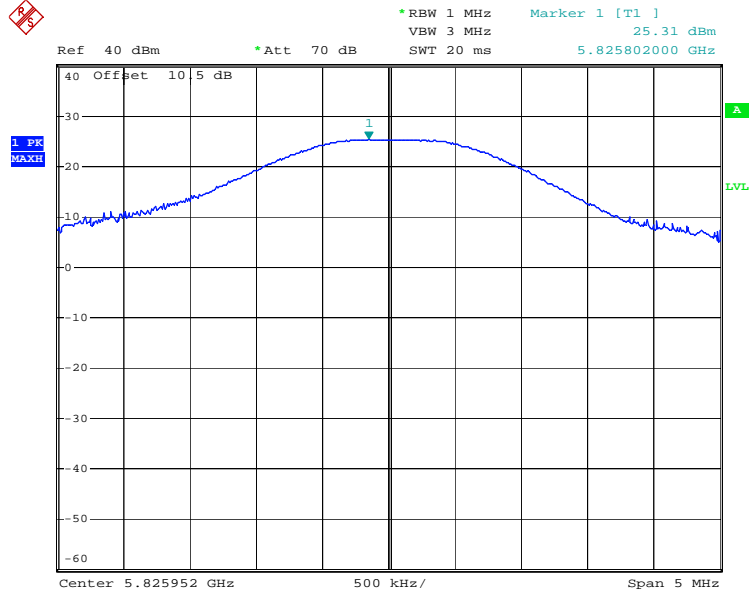
Date: 11.JUN.2007 15:05:48

Mid Channel:



Date: 11.JUN.2007 15:06:48

High Channel:



Date: 11.JUN.2007 15:07:54

Radiated Output Power:

Ch.	Freq. MHz	Pol V/H	ANT.	Rx dBµV	Cable loss dB	Ant Factor dB	F.S. dBuV/m
low	5745.0000	Horn2	V	69.1	9.4	34.6	113.1
	5745.0000	Horn2	H	69.2	9.4	34.7	113.3
mid	5785.0000	Horn2	V	72.1	9.6	34.6	116.3
	5785.0000	Horn2	H	71.1	9.6	34.7	115.3
hi	5826.0000	Horn2	V	73.6	9.5	34.6	117.7
	5826.0000	Horn2	H	70.0	9.5	34.7	114.2

Measured value (V/m) = $10^{(FS/20)} = 0.76736$ V/m

Antenna Gain (numeric) = $10^{(Ag/10)} = 1.2589$

Output Power (W) = $\frac{E^2 R^2}{30G} = 0.14032$ W

- E = Measured Value (V/m)
- R = Measurement distance
- G = Antenna Gain (numeric)

Additional Observations:

All Measurements were performed at 3m using a 1 MHz RBW / VBW.

Clause 15.247(d) Radiated Emissions Not in Restricted Bands

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

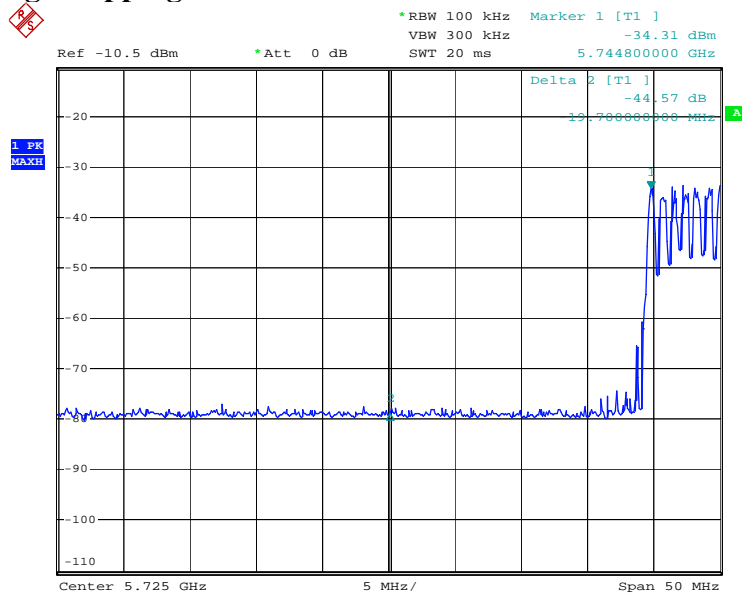
Test Conditions:

Sample Number:	4	Temperature (°C):	20
Date:	June 11, 2007	Humidity (%):	40
Modification State:	0	Tester:	Heng Lin
		Laboratory:	Ottawa

Test Results:

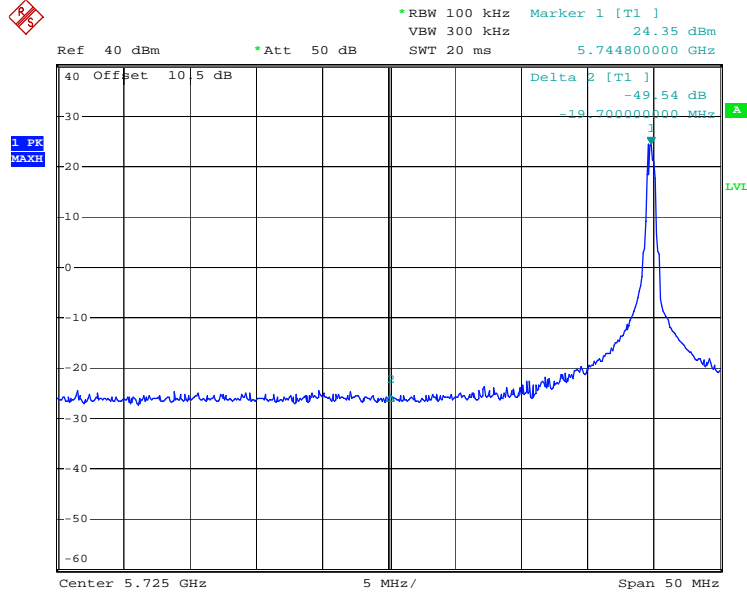
See Attached Table and Plots.

Lower Band Edge Hopping On:



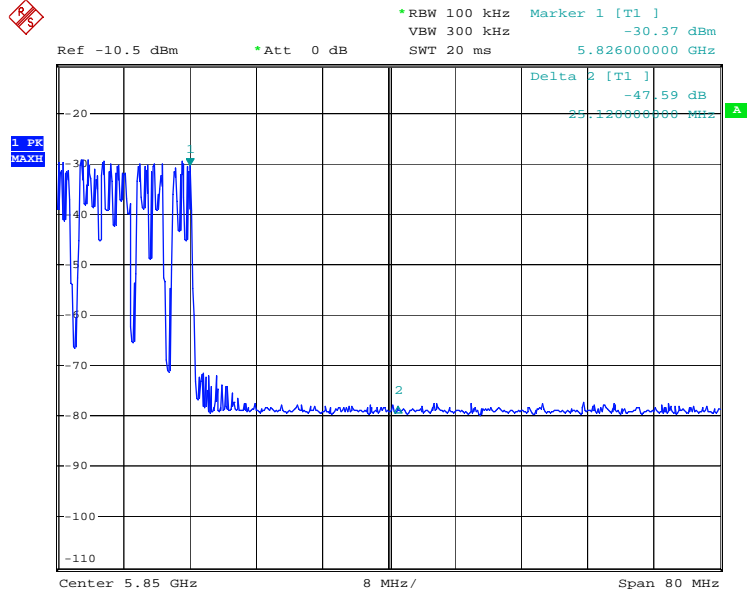
Date: 11.JUN.2007 15:39:25

Lower Band Edge Hopping Off:



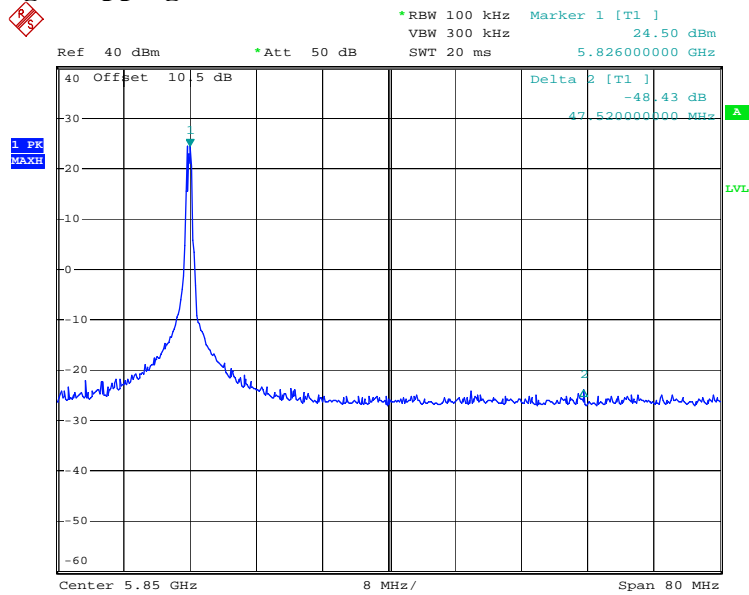
Date: 11.JUN.2007 15:32:40

Upper Band Edge Hopping On:



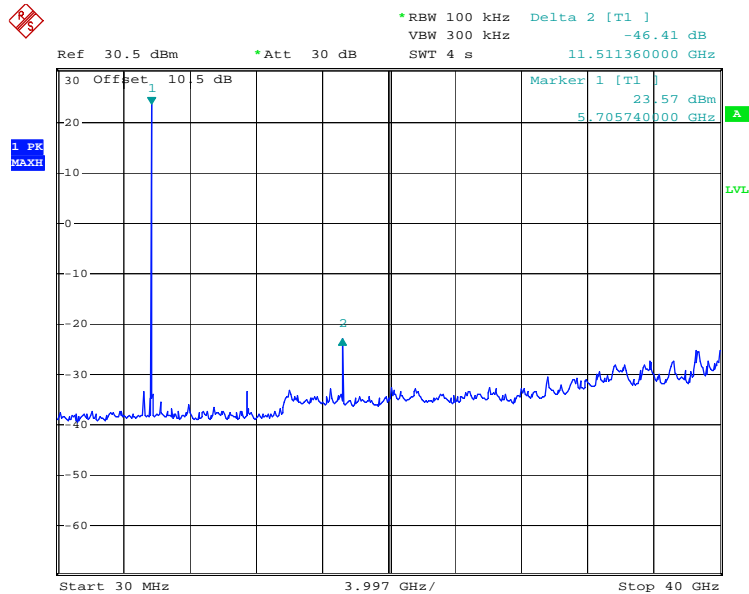
Date: 11.JUN.2007 15:43:40

Upper Band Edge Hopping Off:



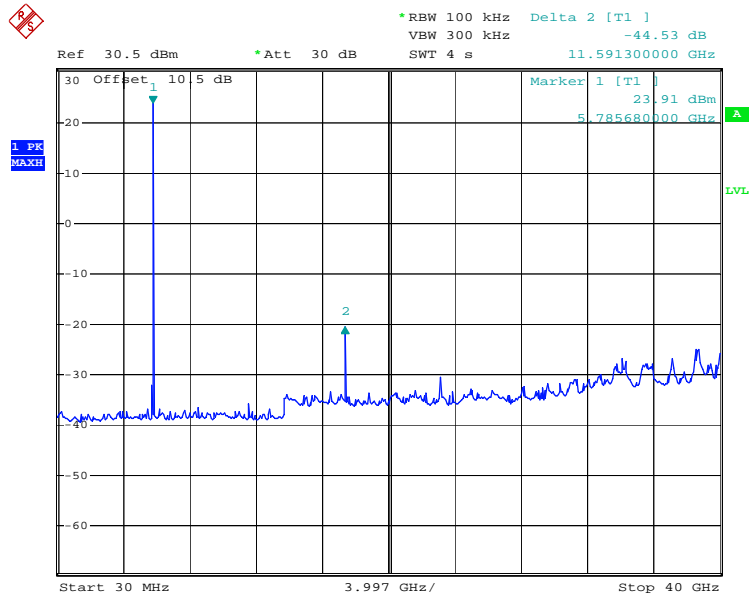
Date: 11.JUN.2007 15:31:46

Conducted Emission Low Channel



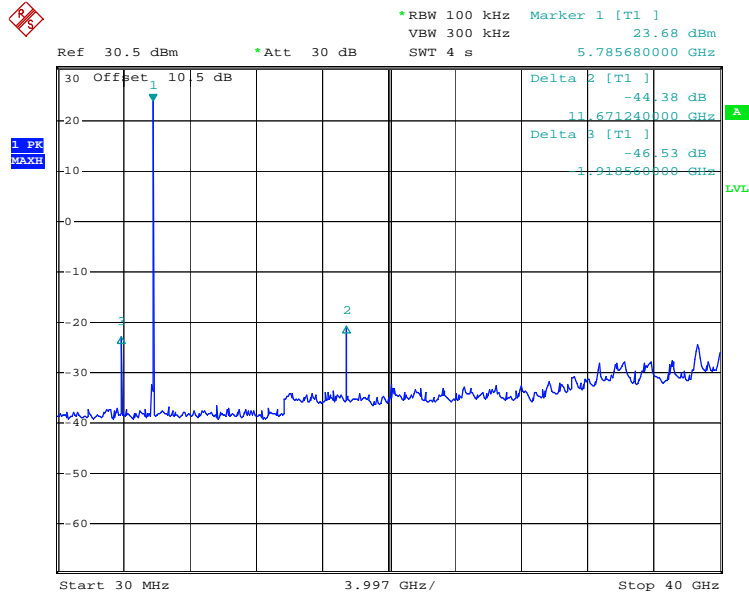
Date: 11.JUN.2007 16:12:57

Mid Channel



Date: 11.JUN.2007 16:14:23

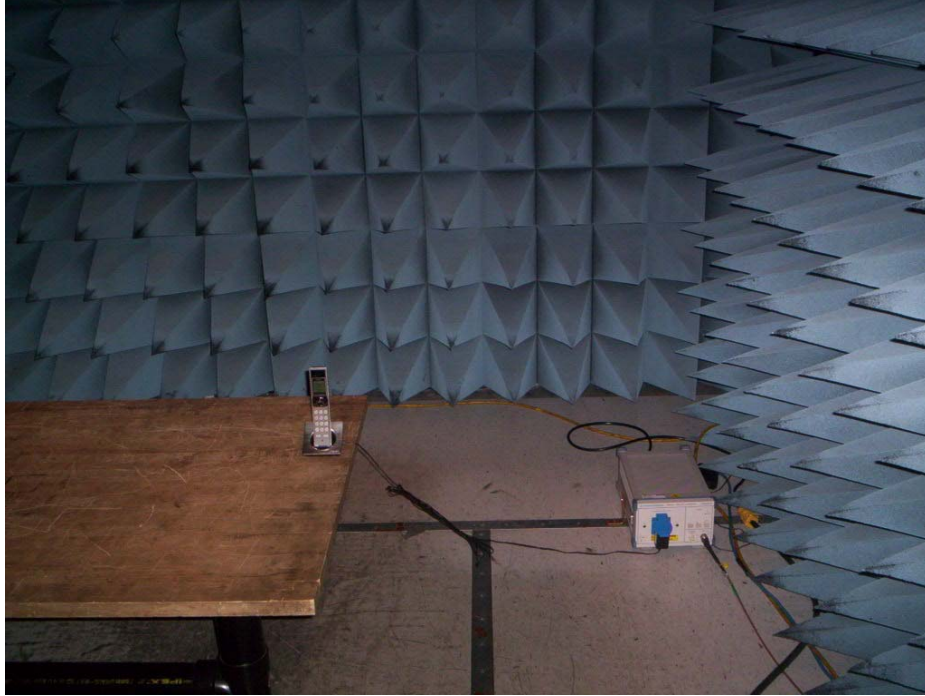
High Channel



Date: 11.JUN.2007 16:15:55

Appendix C : Setup Photographs

Conducted Emissions Setup:

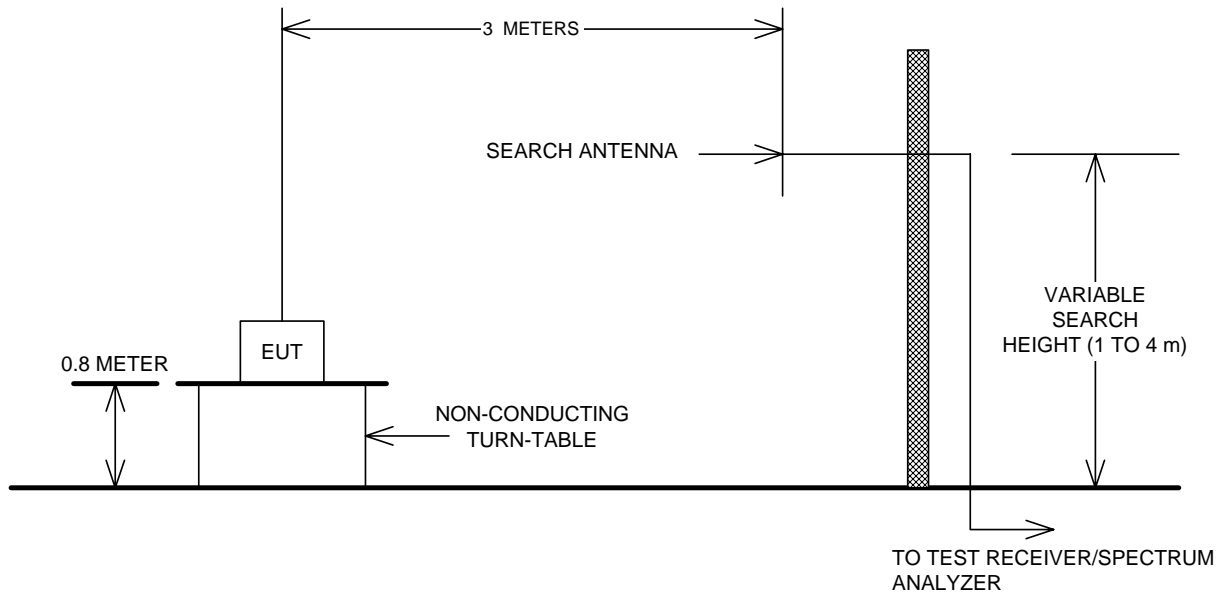


Spurious Emissions Setup:



Appendix D : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions

